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February 5, 2001

1CAN020102

U. S. Nuclear Regulatory Commission
Document Control Desk
Mail Station OP1-17
Washington, DC 20555

Subject: Arkansas Nuclear One - Unit - 1
Docket No. 50-313
License No. DPR-51
Licensee Event Report 50-313/2001-001-00

Gentlemen:

In accordance with 10CFR50.73(a)(2)(iv), enclosed is the subject report concerning a manual reactor trip.

Very truly yours,

Jimmy D. Vandergrift
Director, Nuclear Safety Assurance

JDV/fpv

enclosure

IE22

U. S. NRC
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cc: Mr. Ellis W. Merschhoff
Regional Administrator
U. S. Nuclear Regulatory Commission
Region IV
611 Ryan Plaza Drive, Suite 400
Arlington, TX 76011-8064

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Institute of Nuclear Power Operations
700 Galleria Parkway
Atlanta, GA 30339-5957

LICENSEE EVENT REPORT (LER)

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNBB 7714), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)

Arkansas Nuclear One - Unit 1

DOCKET NUMBER (2)

05000313

PAGE (3)

1 of 4

TITLE (4) Manual Reactor Trip Due To Excessive Main Generator Hydrogen Leakage Caused By A Failed Generator Vent Line

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
01	05	2001	2001	001	00	02	05	2001	FACILITY NAME	DOCKET NUMBER
OPERATING MODE (9)		N	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR: (Check one or more) (11)							
POWER LEVEL (10)		072	20.402(b)			20.405(c)		X	50.73(a)(2)(iv)	73.71(b)
			20.405(a)(1)(i)			50.36(c)(1)			50.73(a)(2)(v)	73.71(c)
			20.405(a)(1)(ii)			50.36(c)(2)			50.73(a)(2)(vii)	OTHER
			20.405(a)(1)(iii)			50.73(a)(2)(i)			50.73(a)(2)(viii)(A)	Specify in
			20.405(a)(1)(iv)			50.73(a)(2)(ii)			50.73(a)(2)(viii)(B)	Abstract Below
			20.405(a)(1)(v)			50.73(a)(2)(iii)			50.73(a)(2)(x)	and in Text

LICENSEE CONTACT FOR THIS LER (12)

NAME

Fred Van Buskirk, Nuclear Safety and Licensing Specialist

TELEPHONE NUMBER (Include Area Code)

501-858-3155

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
B	TK	SPT		N					

SUPPLEMENTAL REPORT EXPECTED (14)

EXPECTED

MONTH

DAY

YEAR

YES

X

NO

SUBMISSION

(If yes, complete EXPECTED SUBMISSION DATE)

DATE (15)

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On January 5, 2001, at approximately 0848, the reactor was manually tripped due to excessive hydrogen leakage from the main generator. A small hydrogen leak was detected at approximately 0445 on January 4, 2001, and a small increase in the leak rate was noted that night. A significant change in leakage occurred at approximately 0830 on January 5, 2001, and a rapid plant shutdown in accordance with pre-planned contingency plans was initiated. During the power reduction operators near the generator reported that significant leakage and loss of hydrogen was occurring. The reactor was then manually tripped to allow a rapid depressurization of the generator via the vent pathway to the turbine building roof. All control rods inserted into the core well within the expected drop time. The post trip plant response was normal and the plant was placed in a stable hot shutdown condition. The cause of the leak was a failed pipe support in the main generator hydrogen cooling system that allowed excessive vibration and ultimate failure of a vent pipe. Following completion of corrective actions the reactor was restarted and tied to the grid at 1853 on January 7, 2001.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

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				2001	001	00	

TEXT (if more space is required, use additional copies of NRC Form 366A) (17)

A. Plant Status

At the time of this event, ANO-1 was at approximately 72 percent power with a power reduction in progress at 10 percent per minute.

B. Event Description

On January 5, 2001, at approximately 0848, the reactor was manually tripped due to excessive hydrogen leakage from the main generator [TB].

The main generator hydrogen cooling system [TK] is utilized to maintain generator hydrogen pressure at approximately 70 psig. A small change in the normal leak rate was noticed on the morning of January 4, 2001 at approximately 0445. A small increase in leakage was observed that night at approximately 2300. Safety barriers were posted and access was controlled into the affected areas of the turbine building. Turbine building ventilation [VK] was maximized in order to accelerate the dispersion of the hydrogen gas and Industrial Safety personnel were dispatched to provide continuous monitoring for explosive mixtures. Operations personnel established plant shutdown criteria based on observed increases in the generator hydrogen leakage or detection of any explosive mixture of hydrogen and oxygen. Operations and Engineering personnel continued to search for the source of the leakage.

A significant increase in the hydrogen leak rate occurred at approximately 0830 on January 5, 2001, and a rapid plant shutdown from 100 percent power was initiated at 0845 based on the pre-determined shutdown criteria. As plant power was reduced the control room received a report from personnel near the generator that the leak rate had increased and a significant loss of generator hydrogen was occurring. At 0848, operators manually tripped the reactor from approximately 72 percent power to prevent overheating of the main generator and to allow rapid depressurization of the generator through the roof vent. All post trip plant responses were normal. There were no engineered safety feature (ESF) [JE] actuations and the plant proceeded to a stable hot shutdown condition. Immediately following the reactor trip the main generator was vented and purged with carbon dioxide. No explosive mixtures of hydrogen and oxygen were detected during the event.

The source of the hydrogen leak was subsequently discovered to be a small bore hydrogen vent line (1/2 inch) connected to the main generator. Field inspections found that one of the pipe supports in the vicinity of the pipe failure was missing both nuts on one of its two bolts allowing the pipe to move freely within the support. The vent pipe was found severed near the generator connection flange approximately 3 feet from the pipe support.

Following completion of corrective maintenance to replace the piping and repair the pipe support, the reactor was restarted and tied to the grid at 1853 on January 7, 2001.

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TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

C. Root Cause

Investigation into the cause of the failure identified a pipe support bolting configuration that was not appropriate for the conditions that were present. The affected piping is designed to be supported by two friction block supports. Each support is secured using two bolts with double nuts on each bolt. The friction block support was found to contain the two bolts; however, both nuts on one of the bolts were missing. This allowed excessive pipe movement within the support. One of the nuts was found directly under the support and upon further inspection the evidence indicated that both of the nuts had been installed but had recently come off of the bolt. There were no anti-loosening methods noted, such as Loc-Tite or staking. Field inspections suggest that resonant frequency in this section of piping caused the double nut arrangement on this particular support to loosen and eventually fall off the bolt. Higher than normal main turbine [TA] vibration during the current operating cycle contributed to this failure. As both nuts loosened, the pipe was no longer properly restrained which altered the pipe structural frequency resulting in increased piping vibration amplitude. The higher vibration caused the pipe failure.

Visual inspection of the break area indicates that the time between crack initiation and a complete through-wall crack was relatively short, possibly a matter of hours. This indicates a high-cycle type of fatigue failure.

D. Corrective Actions

Repairs to the generator vent line and post maintenance leak testing were completed. The degraded pipe support was repaired and reinforced with staked bolted connections to reduce the probability of a recurrence of the failure. Leak checks were performed on similar generator hydrogen supply system piping and structural inspections were performed on system piping, pipe supports, and flanges that are located in the vicinity of the failure. Adjacent pipe supports were also reinforced with staked bolted connections. A balance shot was performed on the main turbine which reduced vibrations.

E. Safety Significance

The main generator and its supporting hydrogen cooling system are not required to be operable in order to achieve safe shutdown of the plant. Safety systems operated as designed following the manual reactor trip and the plant was safely taken to a stable hot shutdown condition. The Reactor Protection System [JC] functioned properly in response to the manual trip signal and there were no actuations or conditions warranting actuation of any ESF systems. Therefore, this event was determined to be of minimal safety significance.

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F. Basis for Reportability

The failure of the main generator vent line and resulting loss of generator hydrogen necessitated a manual reactor trip. Therefore, this event is reportable pursuant to 10CFR50.73(a)(2)(iv) as a manual actuation of the Reactor Protection System.

This event was also reported to the NRC Operations Center in accordance with 10CFR50.72(b)(2)(ii) at 1125 CST on January 5, 2001.

G. Additional Information

There have been no previous similar conditions reported by ANO as Licensee Event Reports (LERs).

The manufacturer of the failed pipe support is not known.

Energy Industry Identification System (EIIS) codes are identified in the text as [XX].